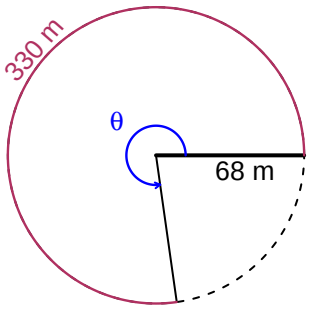
Name: Date:

Trig Final (SLTN v672)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 330 meters. The radius is 68 meters. What is the angle measure in radians?

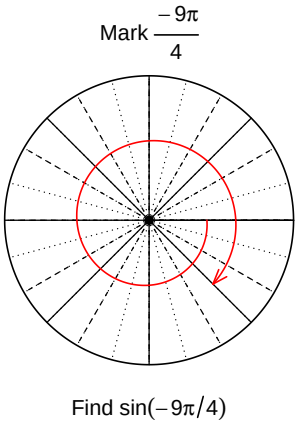


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

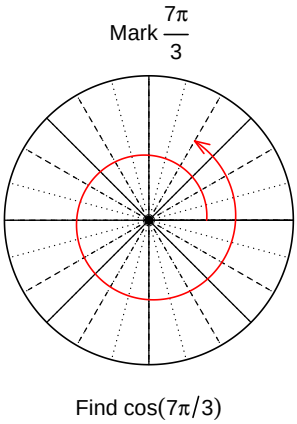
$\theta = 4.853$ radians.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-9\pi/4)$



Find $\cos(7\pi/3)$

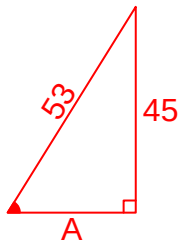
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(7\pi/3) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{45}{53}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

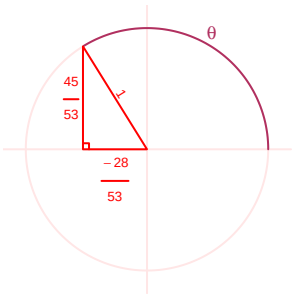
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 45^2 = 53^2$$
$$A = \sqrt{53^2 - 45^2}$$
$$A = 28$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-28}{53}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.29 Hz, an amplitude of 3.02 meters, and a midline at $y = 4.06$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.02\sin(2\pi 6.29t) + 4.06$$

or

$$y = -3.02\sin(12.58\pi t) + 4.06$$

or

$$y = -3.02\sin(39.52t) + 4.06$$